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NATIONAL DAM SAFETY PROGRAM. LAKE WILDWOOD DAM (NJ 00473), HUDS--ETC(U)
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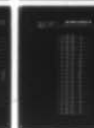
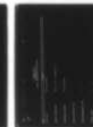
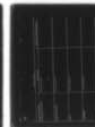
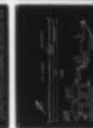
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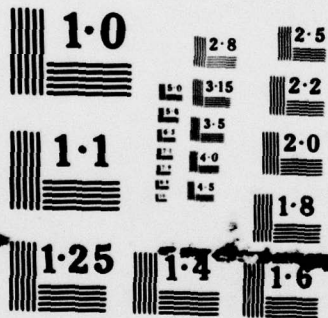
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
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| 18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151. | | |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Lake Wildwood Dam, N.J. Safety Spillway Visual Inspection Structural Analysis National Dam Safety Program Report | | |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's ade- quacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report. | | |

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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PHILADELPHIA, PENNSYLVANIA 19106

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

17 SEP 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Lake Wildwood Dam in Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Lake Wildwood Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 42 percent of the 100-year flood would overtop the dam. The low hazard classification means that failure of the structure would probably result in no loss of life and very minimal economic loss. For this reason, no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner:

- a. Repair the deteriorated concrete spillway walls.
- b. Remove debris that collects on the spillway as part of a regular maintenance program.

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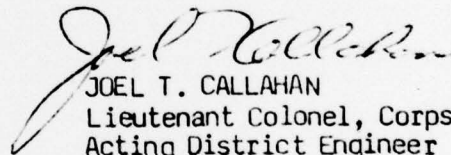
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



JOEL T. CALLAHAN

Lieutenant Colonel, Corps of Engineers
Acting District Engineer

1 Incl
As stated

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
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Trenton, NJ 08625

LAKE WILDWOOD DAM (NJ00473)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 7 May 1979 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Lake Wildwood Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 42 percent of the 100-year flood would overtop the dam. The low hazard classification means that failure of the structure would probably result in no loss of life and very minimal economic loss. For this reason, no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner:

- a. Repair the deteriorated concrete spillway walls.
- b. Remove debris that collects on the spillway as part of a regular maintenance program.

APPROVED: 

JOEL T. CALLAHAN

Lieutenant Colonel, Corps of Engineers
Acting District Engineer

DATE: 13 SEP 79

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

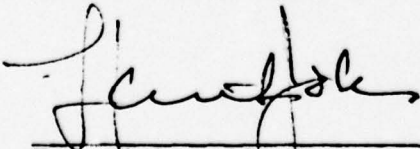
Name of Dam Lake Wildwood Dam Fed ID# NJ 00473

State Located New Jersey
County Located Sussex
Coordinates Lat. 4109.1 - Long. 7409.2
Stream Trib. to Wallkill River
Date of Inspection 7 May 1979

ASSESSMENT OF
GENERAL CONDITIONS

Lake Wildwood Dam is assessed to be in a fair overall condition but is recommended to be downgraded from a high hazard to a low hazard category. Overtopping of the dam would not significantly increase the danger of loss of life or property damage as the downstream floodplain is uninhabited. No detrimental findings were uncovered to render an unfavorable assessment. Remedial action recommended to be undertaken in the future consists of a general rehabilitation of the spillway structure. The debris that collects on the spillway should be removed as part of a regular maintenance program.

The dam has an inadequate spillway capacity, being able to discharge only 41% of the 100 year design flood.


F. Keith Jolle P.E.
Project Manager





OVERVIEW OF LAKE WILDWOOD DAM

MAY, 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: LAKE WILDWOOD DAM FED #NJ00473

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Lake Wildwood Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The dam at Lake Wildwood is a 385-foot long, earth and masonry structure with two concrete spillways located 100 feet from the left abutment. Each has a 8'4" wide, broad-crested weir and are separated by a 9-foot wide concrete pier. The entire dam rests on bedrock and the crest, which is 12-feet wide, slopes at 6H:1V from a vertical masonry wall at the back of the dam to the shoreline.

b. Location

The dam is located on an unnamed tributary of the Wallkill River in Vernon Township, Sussex County and is approximately 2.5 miles east of the village of Hamburg. It is approximately 6,000 feet upstream from the junction of Rudeville and Quarry Roads.

c. Size Classification

The dam at Lake Wildwood has a maximum height of 7 feet and a maximum storage capacity of 283 acre-feet. Accordingly, this dam is in the small size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

While most of the downstream channel between the dam and the Hamburg valley is undeveloped woodlands, there are several homes between 2,000 and 5,000 feet downstream which are located near the banks of the stream. However, the discharge which would be released due to a dam failure is small due to the low height of the dam and the flood wave would be considerably attenuated in the heavily wooded but steep gorge immediately downstream from the dam. The gravel access road to the lake could sustain some damage, but it would be minimal. Accordingly, it is recommended that this dam be downgraded to the low hazard category.

e. Ownership

This dam is owned by the Morford Co. of Hamburg, a lake association comprised of the property owners at Lake Wildwood.

f. Purpose of Dam

The dam at Lake Wildwood was constructed to raise the level of a natural recreational lake.

g. Design and Construction History

The design and construction history of this dam are unknown. According to Lake Association members, the spillways are believed to have been built about twenty years ago but no information is available regarding the design or construction. (See Section 2).

h. Normal Operating Procedures

There are no formal operational or maintenance procedures currently being employed at this dam. The spillways, which have the same crest elevation, maintain the lake level at two feet below the dam crest. There are no regulatory facilities.

1.3 PERTINENT DATA

a. Drainage Area

Lake Wildwood Dam has a drainage area of 0.48 square miles which consists entirely of woodland.

b. Total spillway capacity at maximum pool elevation - 142 cfs

c. Elevations (ft. above MSL)

Top of dam - 1252
Principal spillway crest - 1250
Streambed at centerline of dam - 1245

d. Reservoir

Length of maximum pool (top of dam) -
1,900+ feet

Length of recreation pool (principal spillway crest) - 1,800+ feet

e. Storage (acre-feet)

Top of dam - 283
Recreation pool - 210

f. Reservoir Surface (acres)

Top of dam - 37
Recreation pool - 35

g. Dam

Type - Earth and masonry with 2 concrete spillways

Length - 385 feet

Height - 7 feet

Top Width - 12 feet

Side Slopes - Front -6H:1V, back-vertical

Zoning - Unknown

Impervious Core - Unknown

Cutoff - Unknown

Grout Curtain - None

h. Diversion and Regulating Tunnel - None

i. Spillway

Type - Two concrete broad-crested weirs,
8'-4" wide.

Gates - Spillway on right has a 1-foot high,
stop-log bracket bolted to concrete
walls about 3-feet from entrance.
(stop logs are missing)

U/S Channel - Main reservoir

D/S Channel - Natural bedrock channel

j. Regulating Outlets - None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No information was available regarding the Dam Application, design details or the exact period when the dam was constructed. The NJDEP does not have microfilm records regarding this structure or a Dam Application number.

2.2 CONSTRUCTION

No information was available. Although the spillways were reputedly erected 15 to 20 years ago, they appear much older.

2.3 OPERATION

See Section 4.

2.4 EVALUATION

a. Availability

While nothing is known regarding the original design and construction of the dam, information pertaining to the foundation material was obtained from the Geologic Map of New Jersey and regional engineering soil surveys. The dam is situated across a narrow bedrock saddle which is overlain by very shallow alluvium which consists of coarse sands and gravels with a considerable number of cobbles and boulders. The bedrock upon which the dam is founded is Pre-Cambrian Byram gneiss, a hard dense rock which exhibits a well developed joint system. The bedrock is at or near the ground surface immediately below the dam and to the north and less than ten feet in depth to the east.

b. Adequacy

In view of the dam's modest height and low hazard classification, it is believed that the visual inspection and general technical information available provided sufficient data with which to evaluate the dam.

c. Validity

No meaningful statement can be made as there is a complete absence of engineering data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the dam at Lake Wildwood was performed on May 7, 1979. The dam was found to be in a fair overall condition although it has apparently been neglected for many years. Its configuration is very irregular and overgrown with second-growth trees (see photographs). However, its modest height and bedrock foundations were clearly discernible.

b. Dam

The dam is an earth embankment with a dry, rubble masonry wall which forms the back of the dam crest. The irregular crest is approximately 3 to 4 feet above the underlying bedrock with the exception of the area on the west side of the spillways. At this location the original stream-bed is incised about 4 feet deeper into bedrock. The embankment is completely overgrown with brush and trees (up to 20 inches in diameter) although a foot path extends along the entire length of the crest. The embankment shows little evidence of recent erosion and numerous large size boulders line the shoreline. There is no regular geometric shape and it appears to follow the bedrock ridges of the natural saddle that impounds the lake. The exact length of dam is extremely conjectural as there are no discernible abutment zones.

The lake is heavily silted along the face of the dam and the water is quite shallow for some distance into the lake. In several areas, the bedrock below the dry stonewall is actually above the normal pool. However, some seepage was noted in two areas located about 35 and 155 feet to the right of the spillways. These seeps (or springs) appear to be caused by water permeating beneath the dam at the bedrock/embankment interface. The crest of the embankment is relatively level although minor undulations exist.

c. Appurtenant Structures

The 20" thick concrete wingwalls at both spillways are spalled, cracked, and in an advanced state of deterioration. The walls are partially overgrown with vegetation as is the center pier which separates the spillways. The area behind the right wingwall is eroded and the wall has a vertical structural crack about one foot from its junction with the sidewall of the spillway. The left wingwall is also cracked and is tilted out toward the lake. The concrete center pier is in better condition although some light spalling and surface cracking exists. The approach apron to both spillways is buried by silt and could not be examined. The sloping portion of the outfall apron below the step at the right spillway is cracked, spalled and covered with stone and gravel deposits. The left spillway outfall is in better condition and a more uniform flow was passing over this weir although both crests are at basically the same elevation. The right spillway has steel stoplog racks bolted to the sidewalls about 3 feet back from the approach sill. These 12 inch high steel angles are rusty but appear capable of supporting stoplogs (which are presently missing). Both spillways drop straight into the bedrock channel. Timber railroad ties have been laid across both spillways to form a pedestrian bridge.

d. Reservoir Area

The entire lake is surrounded by steeply rising slopes dotted with bedrock outcroppings. The surrounding hills are heavily wooded and essentially undeveloped with the exception of northwest side of the lake. In this area there are approximately a dozen summer residences. The lake itself is quite shallow near the dam and appears heavily silted.

e. Downstream Channel

The area immediately downstream of the dam has a relatively gentle slope for about 300 feet. The natural channel is incised in the center

of a rather broad (200 yards wide) wooded valley and contains numerous boulders and rock outcrops. Below, the valley narrows and the slope increases as the stream descends the side of the Hamburg mountains. Approximately 4,000 feet downstream, the stream passes through a culvert under the mountain access road. Before crossing Rudeville Road, the slope flattens as the stream reaches the foot of the mountain and enters Hamburg Valley. The decreasing channel size at this point indicates much of the runoff is being naturally diverted to the groundwater regime. Below Rudeville Road, the stream meanders across the wide flat swampy valley prior to its confluence with the Wallkill River just west of Hardistonville.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The dam functions completely unregulated at the present time. The stop logs, originally intended to raise the lake level by one foot, have not been in place for several years. It appears that the Lake Association maintains no operational procedures at the spillways.

4.2 MAINTENANCE OF DAM

Maintenance of the dam and spillways is reportedly performed by members of the lake association but work accomplished is generally limited to light landscaping and debris removal from the spillways or downstream channel. According to the Association representatives, major repairs are contracted out by the association. It appears little, if any, have been recently undertaken.

4.3 DESCRIPTION OF WARNING SYSTEM IN EFFECT

No formal warning system exists at Lake Wildwood although members of the association make periodic inspections of the dam and spillways.

4.4 EVALUATION OF OPERATIONAL ADEQUACY

Since there are no regulatory facilities at the dam, no formal operational procedures are necessary. However, in the opinion of the inspection team, a more intensive program of maintenance and spillway repair appears necessary in view of the advancing deterioration.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Based on the Recommended Guidelines for Safety Inspection of Dams, Lake Wildwood Dam is of small size and low hazard. Accordingly, a 100-year frequency event was chosen as the design storm by the inspecting engineers. Inflow to the reservoir for the selected 100-year storm was computed utilizing precipitation data from Technical Publication 40 and Technical Memo NWS Hydro #35 by the HEC-1 computer program which gave a peak inflow of 2021 cfs. Routing this storm through the reservoir reduced the peak discharge to 343 cfs. As the combined spillway capacity is 142 cfs, they can accommodate only 41% of the 100-year flood before overtopping.

b. Experience Data

There are no records available concerning Lake Wildwood dam.

c. Visual Observations

The analyses indicate that it is possible that the dam could have been overtopped in the past, possibly when spring ice blocked the spillway entrance. However, there is no evidence of recent problems, according to members of the Association.

d. Overtopping Potential

Because the spillway cannot accommodate the design flood, there is potential for future overtopping. No records are available to indicate whether or not the dam has been overtopped in the past but overtopping would not significantly increase the downstream damage potential.

e. Drawdown

There are no means by which the lake can be dewatered. It was noted that the water level in the naturally impounded lake is only a foot or two below the present normal pool.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The concrete spillways are in an advancing stage of deterioration but because they are apparently founded on bedrock, are in no danger of collapse. The only item of concern to the inspection team was the apparent ice damage to the joints between the spillway sidewalls and the upstream wingwalls. The embankment height varies between 3 and 7 feet (immediately adjacent to the spillway) and is of little structural concern. As it is quite heavily covered with trees, there is presently little that can be effectively done to dress or regrade the slopes. The larger trees present an enigma: their removal would practically destroy the embankment stability, but regrading and/or backfilling would possibly kill the trees and reduce the stabilization that the present root systems afford. It is believed the best course of action for this dam is to attempt to stabilize the crest conditions while leaving the trees alone.

b. Design and Construction Data

As set forth in Section 2, nothing is known regarding the details of design or when the dam was constructed.

c. Operating Records

According to local residents, the dam has operated satisfactory for the last 10 to 15 years.

d. Post-Construction Changes

There are no records or evidence of any modifications.

e. Seismic Stability

This dam is located in Zone 1 and due to its geometry and size, has negligible potential vulnerability to earthquake forces. Experience indicates dams in Zone 1 will have adequate stability under dynamic loading conditions if stable under static loading conditions. In view of the modest height to width ratio the embankment is stable under static loading conditions.

SECTION 7 - ASSESSMENTS, RECOMMENDATIONS/ REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the visual inspection procedures stipulated by the Corps of Engineers, the Lake Wildwood dam is assessed as being in a fair overall structural condition although the twin spillways are incapable of transmitting the design flood. The dam embankment is built of unknown material but because of its low height, overtopping would not produce a dangerous condition or exacerbate downstream safety hazards.

b. Adequacy of Information

The information gathered in the field for the Phase I inspection is deemed to be adequate regarding the safe operation and structural stability. It is believed that little other engineering information is available.

c. Urgency

No urgency is attached to the findings contained herein and the spillway repairs can be undertaken in the future as part of the owners maintenance program.

d. Necessity for Further Study

Additional inspections are believed to be unnecessary as the dam does not constitute a hazard to human life or a potential danger to downstream property.

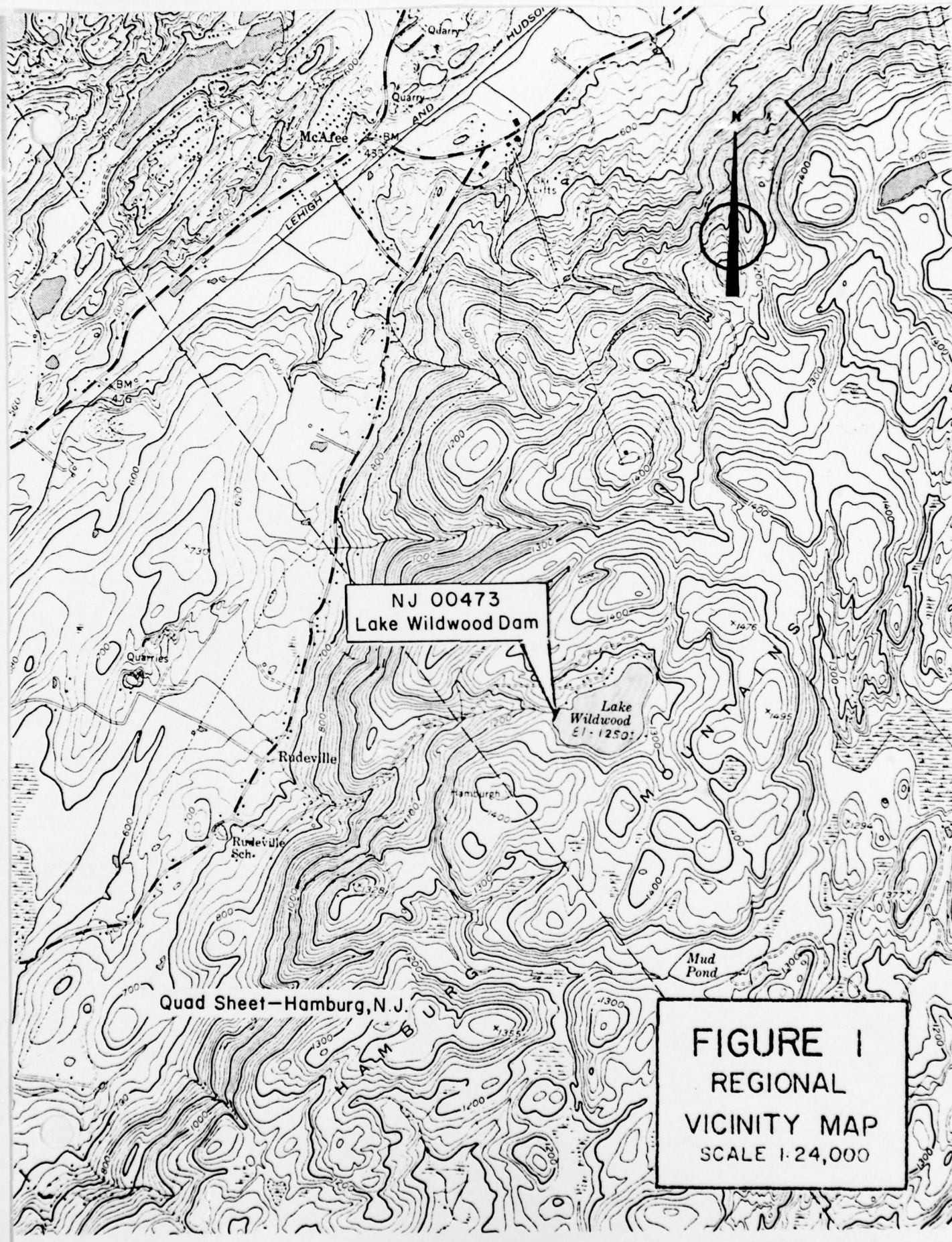
7.2 RECOMMENDATIONS/REMEDIAL MEASURES

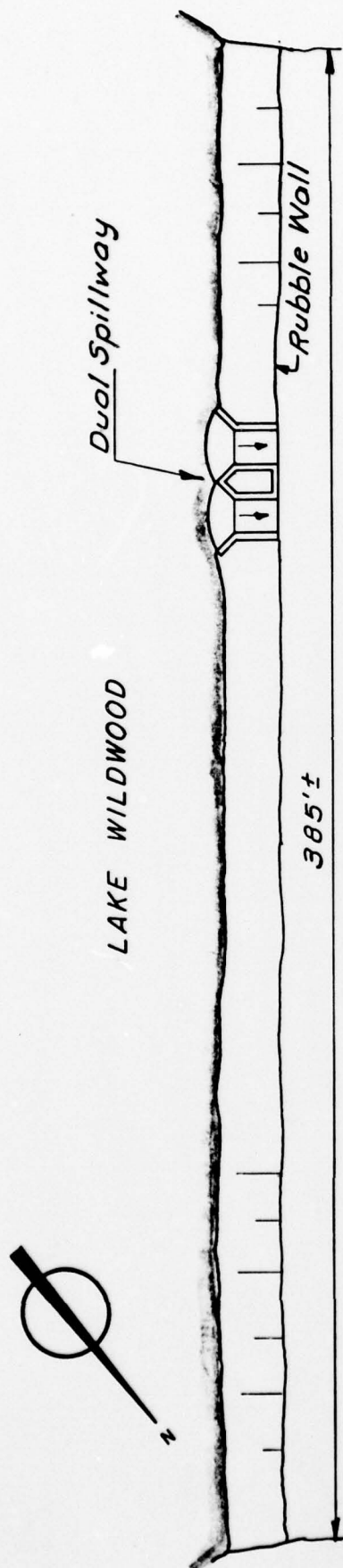
a. Recommendations

On the basis of present conditions, no remedial improvements are envisioned insofar as the spillway capacity is concerned. The owners should undertake the general rehabilitation and repair of the concrete walls in order to halt further deterioration.

b. O&M Maintenance and Procedures

No additional procedures other than those currently undertaken by the owners appear to be warranted in light of the above assessment.





PLAN

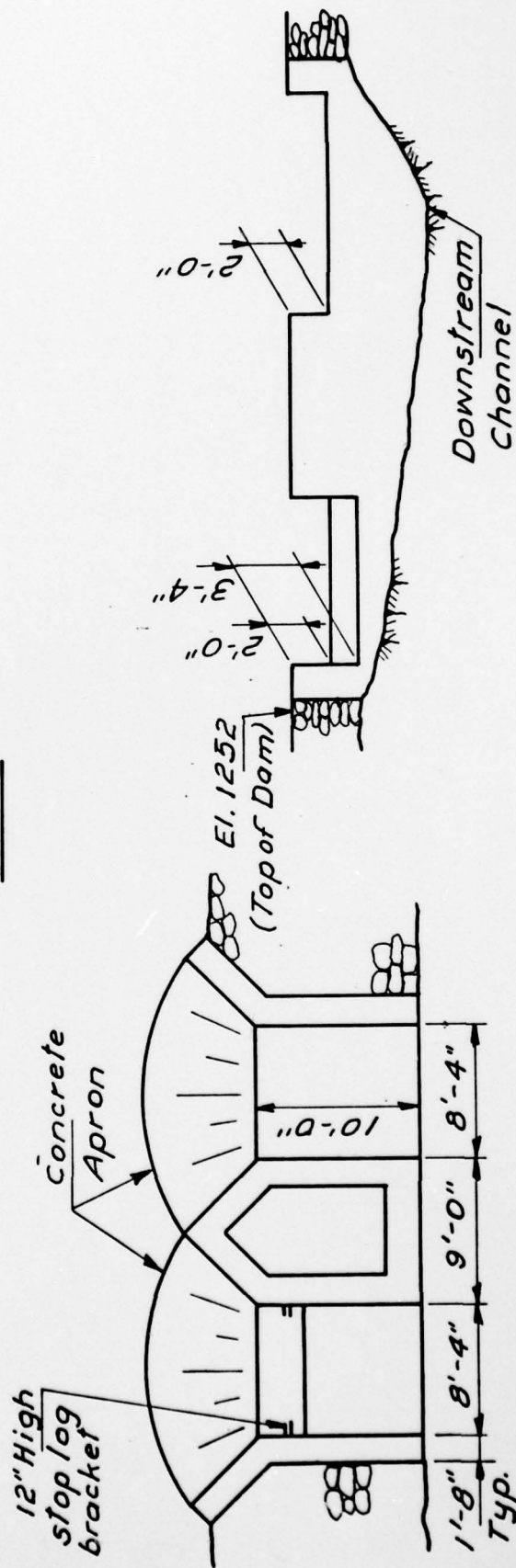


FIGURE 2

Check List
Visual Inspection
Phase 1

Name Dam LAKE WILDWOOD County SUSSEX State N.J. Coordinators NJDEP

Date(s) Inspection 5/7/79 Weather CLEAR Temperature 60°

Pool Elevation at Time of Inspection 1250 M.S.L. Tailwater at Time of Inspection 1245 M.S.L.

Inspection Personnel:

T. Chapter R. Lang

K. Greenfield

K. Jolls

T. Chapter Recorder

EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--|---|---|
| SURFACE CRACKS | None Observed | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None Observed | Entire dam consists of stone wall 3' high across saddle in bedrock. Channel cut into bedrock at spillway about 7' below crest. Embankment placed in front of wall is completely overgrown and stabilized. |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | None Observed | Both abutments are gneiss bedrock outcrops. Crest grades smoothly into both abutments. |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Horizontal alignment relatively uniform. Dam has two curves which appear to have been built into the design. Crest slopes gently from stone wall to waters edge at about 6:1. | |
| RIPRAP FAILURES | Some stone along upstream face but difficult to tell if this is riprap, natural bottom features, or part of original body of dam. | |

EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|--|--|
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | Entire crest and shoreline covered with trees and brush as well as the area immediately behind dam and along downstream channel. Dam has reverted to a natural state. | Few visible vestiges left of original engineered geometry. |
| | Embankment grades smoothly into both abutments and is dry. Two 8' wide concrete spillways separated by 9' wide pier. Retaining walls are all 20" wide and are completely integrated with the embankment. | |
| ANY NOTICEABLE SEEPAGE | Seepage behind right half of dam. Water appears to permeate under dam along top of bedrock. Bedrock is uniformly high below dam with exception of old stream channel. | Seepage is of minor concern. |
| STAFF GAGE AND RECORDER | None Observed | |
| DRAINS | None Observed | |

UNCATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-----------------------|--|--|
| CONCRETE WEIR | Concrete is spalled, cracked and generally deteriorated. Apron is about 10' long with a 5' straight drop to the streambed. | Weir is 20" below crest height of retaining walls. |
| APPROACH CHANNEL | Spalled where visible. Mostly covered with silt between wingwalls. Left wingwall tilting out and broken away from retaining side wall. | |
| DISCHARGE CHANNEL | Weir drops straight to old natural channel. Strewn with boulders and overgrown with large trees. | |
| BRIDGE AND PIERS | Center pier appears in somewhat better shape although most of concrete is buried of overgrown. Foot bridge over spillways consist of several railroad ties laid together. | |
| | | |

GATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-------------------------------|---|--|
| CONCRETE SILL | Ten-inch deep step set about 4' back from wing wall. Apron then slopes to about 40" below crest at back of wall. † | Frame for stoplog about 2' back from wingwall. Stop log missing. |
| APPROACH CHANNEL | Apron 20" below crest height of retaining wall and dam. Area between wingwalls silted to elevation of apron. | |
| DISCHARGE CHANNEL | Slopes from concrete apron over boulder strewn path directly to main channel 10' to left. | |
| BRIDGE AND PIERS | None | |
| GATES AND OPERATION EQUIPMENT | No stop log although frame height indicates the former presence of a 12" flash board. | |

(2)

INSTRUMENTATION

| VISUAL EXAMINATION MONUMENTATION/SURVEYS | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---------------|----------------------------|
| | None observed | |
| OBSERVATION WELLS | None observed | |
| WEIRS | None observed | |
| PIEZOMETERS | None observed | |
| OTHER | | |

RESERVOIR

REMARKS OR RECOMMENDATIONS

VISUAL EXAMINATION OF

OBSERVATIONS

SLOPES

Quite steep, heavily wooded, and essentially devoid of habitation although 12-14 summer homes are located in the vicinity of the north shore.

SEDIMENTATION

Heavy sedimentation immediately in front of dam. Lake quite shallow and entrance to both spillways silted in up to the elevation of the aprons.

DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-----------------------|--------------|----------------------------|
|-----------------------|--------------|----------------------------|

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

Natural channel over flat bedrock is strewn with boulders and completely forested. Several hundred feet downstream the channel narrows and plunges down mountainside.

SLOPES

Gentle on top - becoming steep as stream cuts a gorge down the side of the mountain.

APPROXIMATE NO.
OF HOMES AND
POPULATION

About a dozen homes downstream of dam on the side of mountain but only 1 or 2 appear anywhere near the stream. Two trailers parked near the channel are unoccupied. Two homes near stream where it enters the valley floor. Stream is much smaller at this point than on the side of the mountain indicating much of the water is being directed to groundwater flows.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

| ITEM | REMARKS |
|----------------------------|----------------------------|
| PLAN OF DAM | Not available |
| REGIONAL VICINITY MAP | USGS - Quad - Hamburg N.J. |
| CONSTRUCTION HISTORY | Not available |
| TYPICAL SECTIONS OF DAM | " " |
| HYDROLOGIC/HYDRAULIC DATA | " " |
| OUTLETS - PLAN | " " |
| - DETAILS | " " |
| - CONSTRAINTS | " " |
| - DISCHARGE RATINGS | " " |
| RAINFALL/RESERVOIR RECORDS | " " |

| ITEM | REMARKS |
|--|---------------|
| SPILLWAY PLAN | Not available |
| SECTIONS | " |
| DETAILS | " |
| OPERATING EQUIPMENT PLANS & DETAILS | " |

ITEM REMARKS

DESIGN REPORTS Not available

GEOLOGY REPORTS " "

DESIGN COMPUTATIONS " "
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

MATERIALS INVESTIGATIONS " "
BORING RECORDS
LABORATORY
FIELD

POST-CONSTRUCTION SURVEYS OF DAM Not available

BORROW SOURCES. " "

| ITEM | REMARKS |
|------|---------|
|------|---------|

MONITORING SYSTEMS

None observed

MODIFICATIONS

Unknown

HIGH POOL RECORDS

Not available

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

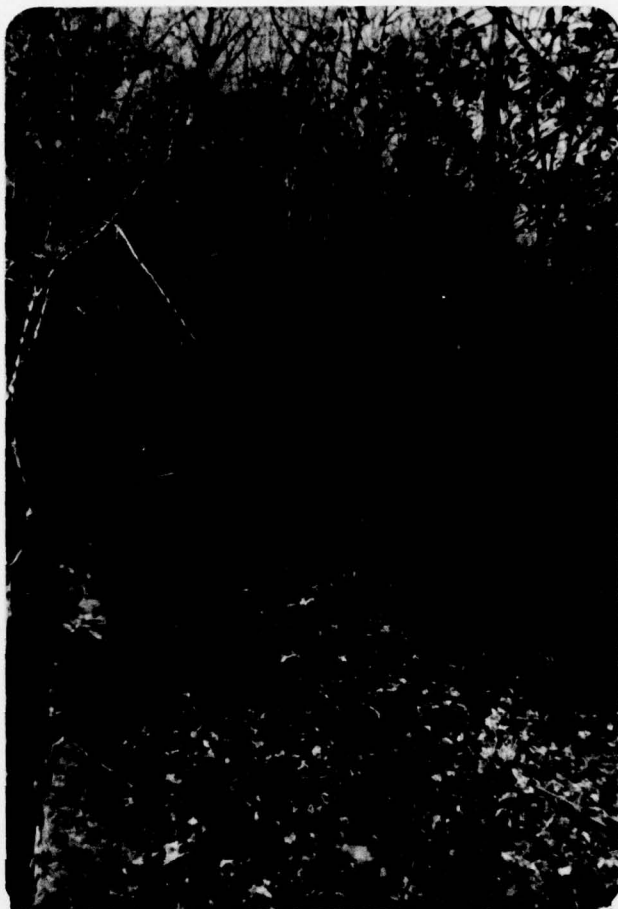
" "

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

" "

MAINTENANCE
OPERATION
RECORDS

" "



May, 1979

View of Crest Looking North



May, 1979

View of Crest Looking South



View of Spillway May, 1979



View of Downstream Channel May, 1979

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.48 sq.mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1250 (210 acre feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: 1251

ELEVATION TOP DAM: 1252 (283 acre feet)

CREST: Twin concrete broad crested weirs

- a. Elevation 1250 MSL
- b. Type Two concrete broad crested weirs
- c. Width 120" each
- d. Length 100" each
- e. Location Spillover 100 to 126 feet from left abutment
- f. Number and Type of Gates 1 manually operated stop log slot.

OUTLET WORKS: _____

- a. Type None
- b. Location _____
- c. Entrance inverts _____
- d. Exit inverts _____
- e. Emergency draindown facilities _____

HYDROMETEOROLOGICAL GAGES: None

- a. Type None
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 142 cfs

BY D. J. M. DATE 6-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A1 OF

CHKD. BY _____ DATE _____

LAKE WILDWOOD DAM

PROJECT C 234

SUBJECT _____

Time of concentration :

length of overland flow = 0.4 miles = 2,112 feet

$$\Delta H = 170' \quad \text{Slope} = \frac{170 \times 100}{2,112} = 8\%$$

Assume a velocity of 3 ft. S⁻¹

$$\text{gives } t_c = \frac{2112}{3 \times 3600} = 0.20 \text{ hours}$$

Alternate method:

$$T_c = \frac{2112^{1.15}}{7,700 \times 170^{0.38}} = 0.12 \text{ hours}$$

California Culverts Method :

$$T_c = \left(\frac{11.9 \times 0.4^3}{170} \right)^{0.385} = 0.12 \text{ hours}$$

use $t_c = 0.16 \text{ hours}$

$$t_p = \frac{0.083}{2} + 0.6 \times 1.6 = 0.138 \text{ hours}$$

$$Q_p = \frac{484 \times 0.48}{0.138} = 1688 \text{ cfs}$$

BY D. J. M. DATE 6-79

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WILDWOOD DAMSHEET NO. A2 OF _____PROJECT C234Unitgraph:

| <u>Time</u> <u>(hours)</u> | <u>T/T_p</u> | <u>Dimensionless</u> <u>Ordinate (D₀)</u> | <u>Q (cfs)</u> <u>= Q_p × D₀</u> |
|-------------------------------|------------------------|---|--|
| 0.083 | 0.603 | 0.649 | 1095 |
| 0.166 | 1.206 | 0.877 | 1480 |
| 0.249 | 1.809 | 0.370 | 624 |
| 0.332 | 2.412 | 0.177 | 299 |
| 0.415 | 3.015 | 0.073 | 123 |
| 0.498 | 3.617 | 0.031 | 52 |
| 0.581 | 4.220 | 0.008 | 14 |

Precipitation data: (see depth duration curve page A5)

| <u>Time</u> <u>(mins)</u> | <u>Precipitation</u> <u>(inches)</u> | <u>Δ</u> <u>(inches)</u> | <u>Rearrange Δ</u> <u>(inches)</u> |
|------------------------------|---|-----------------------------|---------------------------------------|
| 5 | 0.80 | 0.80 | 0.02 |
| 10 | 1.28 | 0.48 | 0.02 |
| 15 | 1.70 | 0.42 | 0.02 |
| 20 | 1.94 | 0.24 | 0.02 |
| 25 | 2.17 | 0.23 | 0.02 |
| 30 | 2.40 | 0.23 | 0.02 |
| 35 | 2.54 | 0.14 | 0.02 |
| 40 | 2.67 | 0.13 | 0.02 |
| 45 | 2.80 | 0.13 | 0.02 |
| 50 | 2.90 | 0.10 | 0.02 |
| 55 | 3.00 | 0.10 | 0.02 |
| 60 | 3.10 | 0.10 | 0.02 |
| 65 | 3.20 | 0.10 | 0.03 |
| 70 | 3.30 | 0.10 | 0.02 |
| 75 | 3.40 | 0.10 | 0.03 |
| 80 | 3.50 | 0.10 | 0.03 |
| 85 | 3.60 | 0.10 | 0.03 |

BY D. J. M. DATE 6-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A3 OF

CHKD. BY _____ DATE _____

LAKE WILDWOOD DAMPROJECT C234

SUBJECT _____

| <u>Time</u> <u>(mins)</u> | <u>Precipitation</u> <u>(inches)</u> | <u>Δ</u> <u>(inches)</u> | <u>Rearrange Δ</u> <u>(inches)</u> |
|------------------------------|---|-----------------------------|---------------------------------------|
| 90 | 3.70 | 0.10 | 0.03 |
| 95 | 3.76 | 0.06 | 0.03 |
| 100 | 3.81 | 0.05 | 0.03 |
| 105 | 3.86 | 0.05 | 0.03 |
| 110 | 3.91 | 0.05 | 0.04 |
| 115 | 3.96 | 0.05 | 0.04 |
| 120 | 4.00 | 0.04 | 0.04 |
| 125 | 4.04 | 0.04 | 0.05 |
| 130 | 4.08 | 0.04 | 0.05 |
| 135 | 4.12 | 0.04 | 0.10 |
| 140 | 4.16 | 0.04 | 0.10 |
| 145 | 4.19 | 0.03 | 0.10 |
| 150 | 4.22 | 0.03 | 0.10 |
| 155 | 4.25 | 0.03 | 0.10 |
| 160 | 4.28 | 0.03 | 0.13 |
| 165 | 4.31 | 0.03 | 0.23 |
| 170 | 4.34 | 0.03 | 0.24 |
| 175 | 4.37 | 0.03 | 0.48 |
| 180 | 4.40 | 0.03 | 0.80 |
| 185 | 4.43 | 0.03 | 0.42 |
| 190 | 4.46 | 0.03 | 0.23 |
| 195 | 4.49 | 0.03 | 0.14 |
| 200 | 4.52 | 0.03 | 0.13 |
| 205 | 4.55 | 0.03 | 0.10 |
| 210 | 4.58 | 0.03 | 0.10 |
| 215 | 4.60 | 0.02 | 0.10 |
| 220 | 4.62 | 0.02 | 0.10 |
| 225 | 4.64 | 0.02 | 0.06 |
| 230 | 4.67 | 0.03 | 0.05 |
| 235 | 4.69 | 0.02 | 0.05 |
| 240 | 4.71 | 0.02 | 0.04 |
| 245 | 4.74 | 0.03 | 0.04 |

BY D. J. M. DATE 6-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A3a OF

CHKD. BY _____ DATE _____

LAKE WILDWOOD DAMPROJECT C234

SUBJECT _____

| <u>Time</u> <u>(mins)</u> | <u>Precipitation</u> <u>(inches)</u> | <u>Δ</u> <u>(inches)</u> | <u>Rearrange Δ</u> <u>(inches)</u> |
|------------------------------|---|-----------------------------|---------------------------------------|
| 250 | 4.76 | 0.02 | 0.03 |
| 255 | 4.78 | 0.02 | 0.03 |
| 260 | 4.80 | 0.02 | 0.03 |
| 265 | 4.82 | 0.02 | 0.03 |
| 270 | 4.84 | 0.02 | 0.03 |
| 275 | 4.86 | 0.02 | 0.03 |
| 280 | 4.88 | 0.02 | 0.03 |
| 285 | 4.90 | 0.02 | 0.02 |
| 290 | 4.92 | 0.02 | 0.02 |
| 295 | 4.94 | 0.02 | 0.02 |
| 300 | 4.96 | 0.02 | 0.03 |
| 305 | 4.98 | 0.02 | 0.02 |
| 310 | 5.00 | 0.02 | 0.02 |
| 315 | 5.02 | 0.02 | 0.02 |
| 320 | 5.04 | 0.02 | 0.02 |
| 325 | 5.06 | 0.02 | 0.02 |
| 330 | 5.08 | 0.02 | 0.02 |
| 335 | 5.10 | 0.02 | 0.02 |
| 340 | 5.12 | 0.02 | 0.02 |
| 345 | 5.14 | 0.02 | 0.02 |
| 350 | 5.16 | 0.02 | 0.02 |
| 355 | 5.18 | 0.02 | 0.02 |
| 360 | 5.20 | 0.02 | 0.02 |

BY D.J.M. DATE 6-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A4 OF

CHKD. BY _____ DATE _____

LAKE WILDWOOD DAM

PROJECT C 234

SUBJECT Spillway discharge capacity

Spillway discharge:

| flow over 2 weirs $\pm L = 16.7'$ | | | flow over dam $L = 368.3'$ | | | ΣQ cfs |
|--------------------------------------|-----|------|-------------------------------|-----|-------|-------------------|
| H | C | Q | H | C | Q | |
| 0 | 3.0 | 0 | | | | 0 |
| 1 | 3.0 | 50 | | | | 50 |
| 2 | 3.0 | 142 | | | | 142 |
| 2.5 | 2.9 | 191 | 0.5 | 2.7 | 352 | 543 |
| 3 | 2.9 | 252 | 1.0 | 2.7 | 994 | 1246 |
| 4 | 2.9 | 387 | 2.0 | 2.7 | 2813 | 3200 |
| 5 | 2.9 | 541 | 3.0 | 2.7 | 5167 | 5708 |
| 6 | 2.9 | 712 | 4.0 | 2.7 | 7955 | 8667 |
| 7 | 2.9 | 897 | 5.0 | 2.7 | 11118 | 12015 |
| 8 | 2.9 | 1096 | 6.0 | 2.7 | 14615 | 15711 |

Spillway discharge
(cfs)

LAKE WILDWOOD DAM
STAGE DISCHARGE CURVE

8,000

7,000

6,000

5,000

4,000

3,000

2,000

1,000

1

2

3

4

5

Height (in feet) above spillway crest

Spillway capacity @ top of dam = 142 cfs

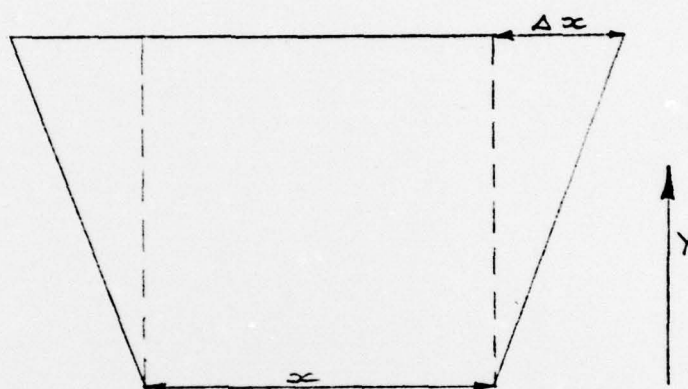
BY D. J. M. DATE 6-79
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
LAKE WILDWOOD DAM

SHEET NO. A6 OF
 PROJECT C234

Surcharge storage :

Area of lake @ normal pool = 35 acres
 " " @ top of dam =
 Area of 1260' contour = 46 acres



Increment in volume $\Delta v = (x + \Delta x) Y$

| <u>Height in feet</u> <u>above crest</u> | <u>Surcharge storage</u> <u>(acre feet)</u> |
|---|--|
| 0 | 0 |
| 1 | 36 |
| 2 | 73 |
| 3 | 111 |
| 4 | 150 |
| 5 | 191 |
| 6 | 233 |
| 7 | 276 |
| 8 | 320 |

LAKE WILDWOOD DAM
STAGE STORAGE CURVE

Surcharge storage
(acre feet)

300

250

200

150

100

50

2

4

6

8

Height (in feet) above crest

46 0706

10 X 10 TO THE INCH • 7 X 10 INCHES
KUPPEL & ESSEN CO. MADE IN U.S.A.

BY D. J. M. DATE 6-79

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A3 OF

CHKD. BY _____ DATE _____

LAKE WILDWOOD DAM

PROJECT C234

SUBJECT _____

GENERAL SUMMARY OF APPENDIX:

length of dam = 385'

Effective length of spillway = 16.7'

Spillway capacity @ top of dam = 142 cfs

Surcharge storage @ top of dam = 73 acre feet

Normal pool storage = 210 acre feet

Total storage @ top of dam = 283 acre feet

Area of lake @ normal pool = 35 acres

Area of lake @ top of dam = 37 acres

Drainage area = 0.48 square miles

BY D.J.M. DATE June 77
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WILDWOOD DAM

SHEET NO. A9 OF _____
 PROJECT C-224

LAKE WILDWOOD DAM
 BY D.J.M.
 JUNE 29 1979

JOB SPECIFICATION

| NO | NHR | NMIN | IDAY | IHR | IMIN | METRC | IPLT | IPRT | NSTAN |
|-----|-----|------|------|-------|------|-------|------|------|-------|
| 100 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | JOPER | NWT | | | | |
| | | | | 3 | 0 | | | | |

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

| ISTAG | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME |
|-------|-------|-------|-------|------|------|-------|
| 1 | 0 | 0 | 0 | 0 | 0 | 1 |

HYDROGRAPH DATA

| IMYDG | IUHG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|-------|------|-------|------|-------|-------|-------|-------|-------|-------|
| 0 | -1 | 0.48 | 0.0 | 0.48 | 0.0 | 0.0 | 0 | 0 | 0 |

PRECIP DATA

| NP | STORM | DAJ | DAK |
|----|-------|-----|-----|
| 72 | 0.0 | 0.0 | 0.0 |

PRECIP PATTERN

| | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 0.03 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.10 | 0.10 | 0.10 | 0.10 |
| 0.10 | 0.13 | 0.23 | 0.24 | 0.48 | 0.60 | 0.42 | 0.23 | 0.14 | 0.13 |
| 0.10 | 0.10 | 0.10 | 0.10 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 | 0.03 |
| 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 |
| 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| 0.02 | 0.02 | | | | | | | | |

LOSS DATA

| STRKR | DLTKR | RTIOL | ERAIN | STRKS | RTIOK | STRTL | CNSTL | ALSMX | RTIMP |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 1.00 | 0.50 | 0.10 | 0.0 | 0.0 |

GIVEN UNIT GRAPH, NUHQ= 7

| | | | | | | |
|--|-------|------|------|------|-----|-----|
| 1095. | 1480. | 624. | 299. | 123. | 52. | 14. |
| UNIT GRAPH TOTALS 3687. CFS OR 0.99 INCHES OVER THE AREA | | | | | | |

RECESSION DATA

| | | | | | |
|--------|-----|--------|-----|--------|------|
| STRTQ= | 0.0 | GRCSN= | 0.0 | RTIOR= | 1.00 |
|--------|-----|--------|-----|--------|------|

END-OF-PERIOD FLOW

| TIME | RAIN | EXCS | COMP Q |
|------|------|------|--------|
| 1 | 0.02 | 0.00 | 0. |
| 2 | 0.02 | 0.00 | 0. |
| 3 | 0.02 | 0.00 | 0. |
| 4 | 0.02 | 0.00 | 0. |
| 5 | 0.02 | 0.00 | 0. |

BY D.J.M. DATE 6-77
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
LAKE WILDWOOD DAM

SHEET NO. A12 OF
PROJECT C-224

| | | | |
|----|------|------|-------|
| 6 | 0.02 | 0.00 | 0. |
| 7 | 0.02 | 0.00 | 0. |
| 8 | 0.02 | 0.00 | 0. |
| 9 | 0.02 | 0.00 | 0. |
| 10 | 0.02 | 0.00 | 0. |
| 11 | 0.02 | 0.00 | 0. |
| 12 | 0.02 | 0.00 | 0. |
| 13 | 0.03 | 0.00 | 0. |
| 14 | 0.02 | 0.00 | 0. |
| 15 | 0.03 | 0.00 | 0. |
| 16 | 0.03 | 0.00 | 0. |
| 17 | 0.03 | 0.00 | 0. |
| 18 | 0.03 | 0.00 | 0. |
| 19 | 0.03 | 0.00 | 0. |
| 20 | 0.03 | 0.00 | 0. |
| 21 | 0.03 | 0.00 | 0. |
| 22 | 0.04 | 0.03 | 35. |
| 23 | 0.04 | 0.03 | 82. |
| 24 | 0.04 | 0.03 | 101. |
| 25 | 0.05 | 0.04 | 122. |
| 26 | 0.05 | 0.04 | 140. |
| 27 | 0.10 | 0.09 | 203. |
| 28 | 0.10 | 0.09 | 280. |
| 29 | 0.10 | 0.09 | 313. |
| 30 | 0.10 | 0.09 | 328. |
| 31 | 0.10 | 0.09 | 335. |
| 32 | 0.13 | 0.12 | 370. |
| 33 | 0.23 | 0.22 | 525. |
| 34 | 0.24 | 0.23 | 702. |
| 35 | 0.48 | 0.47 | 1051. |
| 36 | 0.80 | 0.79 | 1797. |
| 37 | 0.42 | 0.41 | 2021. |
| 38 | 0.23 | 0.22 | 1529. |
| 39 | 0.14 | 0.13 | 1039. |
| 40 | 0.13 | 0.12 | 715. |
| 41 | 0.10 | 0.09 | 527. |
| 42 | 0.10 | 0.09 | 411. |
| 43 | 0.10 | 0.09 | 363. |
| 44 | 0.10 | 0.09 | 346. |
| 45 | 0.06 | 0.05 | 296. |
| 46 | 0.05 | 0.04 | 224. |
| 47 | 0.05 | 0.04 | 184. |
| 48 | 0.04 | 0.03 | 155. |
| 49 | 0.04 | 0.03 | 132. |
| 50 | 0.03 | 0.02 | 112. |
| 51 | 0.03 | 0.02 | 93. |
| 52 | 0.03 | 0.02 | 85. |
| 53 | 0.03 | 0.02 | 82. |
| 54 | 0.03 | 0.02 | 81. |
| 55 | 0.03 | 0.02 | 80. |
| 56 | 0.03 | 0.02 | 80. |
| 57 | 0.02 | 0.01 | 69. |
| 58 | 0.02 | 0.01 | 54. |
| 59 | 0.02 | 0.01 | 48. |
| 60 | 0.02 | 0.01 | 45. |
| 61 | 0.02 | 0.01 | 44. |
| 62 | 0.02 | 0.01 | 43. |
| 63 | 0.02 | 0.01 | 43. |
| 64 | 0.02 | 0.01 | 43. |
| 65 | 0.02 | 0.01 | 43. |
| 66 | 0.02 | 0.01 | 43. |

BY D.J.M. DATE 6/79
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
LAKE WILDWOOD DAM

SHEET NO. 11 OF 11
PROJECT 223

| | | | |
|-----|------|------|--------|
| 67 | 0.02 | 0.01 | 43. |
| 68 | 0.02 | 0.01 | 43. |
| 69 | 0.02 | 0.01 | 43. |
| 70 | 0.02 | 0.01 | 43. |
| 71 | 0.02 | 0.01 | 43. |
| 72 | 0.02 | 0.01 | 43. |
| 73 | 0.0 | 0.0 | 30. |
| 74 | 0.0 | 0.0 | 13. |
| 75 | 0.0 | 0.0 | 6. |
| 76 | 0.0 | 0.0 | 2. |
| 77 | 0.0 | 0.0 | 1. |
| 78 | 0.0 | 0.0 | 0. |
| 79 | 0.0 | 0.0 | 0. |
| 80 | 0.0 | 0.0 | 0. |
| 81 | 0.0 | 0.0 | 0. |
| 82 | 0.0 | 0.0 | 0. |
| 83 | 0.0 | 0.0 | 0. |
| 84 | 0.0 | 0.0 | 0. |
| 85 | 0.0 | 0.0 | 0. |
| 86 | 0.0 | 0.0 | 0. |
| 87 | 0.0 | 0.0 | 0. |
| 88 | 0.0 | 0.0 | 0. |
| 89 | 0.0 | 0.0 | 0. |
| 90 | 0.0 | 0.0 | 0. |
| 91 | 0.0 | 0.0 | 0. |
| 92 | 0.0 | 0.0 | 0. |
| 93 | 0.0 | 0.0 | 0. |
| 94 | 0.0 | 0.0 | 0. |
| 95 | 0.0 | 0.0 | 0. |
| 96 | 0.0 | 0.0 | 0. |
| 97 | 0.0 | 0.0 | 0. |
| 98 | 0.0 | 0.0 | 0. |
| 99 | 0.0 | 0.0 | 0. |
| 100 | 0.0 | 0.0 | 0. |
| SUM | 5.19 | 4.18 | 15724. |

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
2021. 218. 157. 157.
CFS 4.23 4.23 4.23 4.23
INCHES 108. 108. 108. 108.
AC-FT

HYDROGRAPH ROUTING

| ROUTING THROUGH RESERVOIR | | | | | | | | | |
|-----------------------------------|-------|-------|-------|-------|-------|-------|--------------|--------|--------|
| ISTAG | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME | ROUTING DATA | | |
| 11 | 1 | 0 | 0 | 0 | 0 | 1 | QLOSS | CLOSS | AVG |
| | | | | | | | 0.0 | 0.0 | 0.0 |
| | | | | | | | 0.0 | 0.0 | 0.0 |
| NSTPS NSTOL LAG AMSKK X TSK STORA | | | | | | | IRIS ISAME | | |
| 1 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0. | 1 | 0 | 0 |
| 0. | 36. | 73. | 83. | 111. | 150. | 191. | 3200. | 5708. | 320. |
| 0. | 50. | 142. | 543. | 1246. | 3200. | 5708. | 8667. | 12015. | 15711. |
| STORAGE= | 0. | 73. | 83. | 111. | 150. | 191. | 233. | 276. | 320. |
| OUTFLOW= | 0. | 142. | 543. | 1246. | 3200. | 5708. | 8667. | 12015. | 15711. |

BY D. J. M. DATE 6-79

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WILLOWOOD DAM

SHEET NO. AR OF

PROJECT 2224

| TIME | EOP STOR | AVG IN | EOP OUT |
|------|----------|--------|---------|
| 1 | 0. | 0. | 0. |
| 2 | 0. | 0. | 0. |
| 3 | 0. | 0. | 0. |
| 4 | 0. | 0. | 0. |
| 5 | 0. | 0. | 0. |
| 6 | 0. | 0. | 0. |
| 7 | 0. | 0. | 0. |
| 8 | 0. | 0. | 0. |
| 9 | 0. | 0. | 0. |
| 10 | 0. | 0. | 0. |
| 11 | 0. | 0. | 0. |
| 12 | 0. | 0. | 0. |
| 13 | 0. | 0. | 0. |
| 14 | 0. | 0. | 0. |
| 15 | 0. | 0. | 0. |
| 16 | 0. | 0. | 0. |
| 17 | 0. | 0. | 0. |
| 18 | 0. | 0. | 0. |
| 19 | 0. | 0. | 0. |
| 20 | 0. | 0. | 0. |
| 21 | 0. | 0. | 0. |
| 22 | 0. | 17. | 0. |
| 23 | 1. | 58. | 1. |
| 24 | 1. | 91. | 2. |
| 25 | 2. | 112. | 3. |
| 26 | 3. | 131. | 4. |
| 27 | 4. | 172. | 5. |
| 28 | 6. | 242. | 8. |
| 29 | 8. | 297. | 10. |
| 30 | 10. | 321. | 13. |
| 31 | 12. | 352. | 16. |
| 32 | 14. | 352. | 20. |
| 33 | 17. | 447. | 24. |
| 34 | 21. | 614. | 29. |
| 35 | 27. | 877. | 37. |
| 36 | 36. | 1424. | 51. |
| 37 | 49. | 1909. | 83. |
| 38 | 61. | 1775. | 111. |
| 39 | 69. | 1284. | 131. |
| 40 | 74. | 877. | 169. |
| 41 | 76. | 621. | 279. |
| 42 | 78. | 469. | 325. |
| 43 | 78. | 387. | 340. |
| 44 | 78. | 354. | 343. |
| 45 | 78. | 321. | 338. |
| 46 | 77. | 260. | 319. |
| 47 | 77. | 204. | 291. |
| 48 | 76. | 170. | 262. |
| 49 | 75. | 144. | 233. |
| 50 | 75. | 122. | 206. |
| 51 | 74. | 102. | 181. |
| 52 | 73. | 89. | 159. |
| 53 | 73. | 84. | 142. |
| 54 | 73. | 81. | 141. |
| 55 | 72. | 80. | 140. |
| 56 | 72. | 80. | 139. |
| 57 | 71. | 74. | 138. |
| 58 | 71. | 62. | 136. |
| 59 | 70. | 51. | 135. |
| 60 | 70. | 46. | 133. |

BY C.T.M. DATE 6-79
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

LAKE WILLYWOOD DAM

SHEET NO. 113 OF
 PROJECT C-234

| | | | | | |
|--------|-----------|-------------|-------------|-------------|--------------------|
| | 61 | 69. | 44. | 132. | |
| | 62 | 68. | 43. | 130. | |
| | 63 | 68. | 43. | 129. | |
| | 64 | 67. | 43. | 128. | |
| | 65 | 67. | 43. | 126. | |
| | 66 | 66. | 43. | 125. | |
| | 67 | 65. | 43. | 123. | |
| | 68 | 65. | 43. | 122. | |
| | 69 | 64. | 43. | 121. | |
| | 70 | 64. | 43. | 119. | |
| | 71 | 63. | 43. | 118. | |
| | 72 | 63. | 43. | 117. | |
| | 73 | 62. | 37. | 115. | |
| | 74 | 62. | 22. | 114. | |
| | 75 | 61. | 9. | 112. | |
| | 76 | 60. | 4. | 110. | |
| | 77 | 59. | 1. | 108. | |
| | 78 | 59. | 0. | 106. | |
| | 79 | 58. | 0. | 105. | |
| | 80 | 57. | 0. | 103. | |
| | 81 | 57. | 0. | 101. | |
| | 82 | 56. | 0. | 99. | |
| | 83 | 55. | 0. | 98. | |
| | 84 | 55. | 0. | 96. | |
| | 85 | 54. | 0. | 94. | |
| | 86 | 53. | 0. | 93. | |
| | 87 | 53. | 0. | 91. | |
| | 88 | 52. | 0. | 90. | |
| | 89 | 51. | 0. | 88. | |
| | 90 | 51. | 0. | 87. | |
| | 91 | 50. | 0. | 85. | |
| | 92 | 50. | 0. | 84. | |
| | 93 | 49. | 0. | 82. | |
| | 94 | 48. | 0. | 81. | |
| | 95 | 48. | 0. | 80. | |
| | 96 | 47. | 0. | 78. | |
| | 97 | 47. | 0. | 77. | |
| | 98 | 46. | 0. | 76. | |
| | 99 | 46. | 0. | 74. | |
| | 100 | 45. | 0. | 73. | |
| | SUM | | | 9188. | |
| CFS | PEAK 343. | 6-HOUR 127. | 24-HOUR 92. | 72-HOUR 92. | TOTAL VOLUME 9188. |
| INCHES | | 2.47 | 2.47 | 2.47 | 2.47 |
| AC-FT | | 63. | 63. | 63. | 63. |

RUNOFF SUMMARY, AVERAGE FLOW

| | | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | AREA |
|---------------|----|-------|--------|---------|---------|------|
| HYDROGRAPH AT | 1 | 2021. | 218. | 157. | 157. | 0.48 |
| ROUTED TO | 11 | 343. | 127. | 92. | 92. | 0.48 |